Platform Cooperativism Consortium

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DIGITAL PLATFORMS AS A PATHWAY FOR DRIVING INVESTMENT INTO SMALL-SCALE FISHING COOPERATIVES AND THE BLUE ECONOMY IN LATIN AMERICA

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Abstract

Small-scale fisheries support 492 million livelihoods, provide 40% of global catch and employ 90% of the capture fisheries workforce, yet fishing communities are largely excluded from the rapidly growing Blue Economy. This paper examines how digital platforms could help bridge the investment gap between small-scale fishing cooperatives and emerging capital streams, using Mexico as a case study. Mexico has over 3,600 registered fishing cooperatives, but decades of neoliberal reform have weakened cooperative structures, creating a paradox where some of the most sustainable fishing organizations struggle to access capital, markets, or technical assistance. We surveyed 84 fishing cooperatives across eight Mexican coastal states and engaged with impact investors through Blue Economy forums and workshops to identify barriers to investment. Our results reveal a "formality gap", where most cooperatives maintain governance structures consistent with effective common pool resource management, many lack the financial documentation, credit history and administrative infrastructure that investors require. Thirty percent lack institutional bank accounts, only 29% hold property titles in the cooperative's name and less than 15% have ever received formal credit previously. From the investor perspective, due diligence costs are disproportionate to the small capital allocations cooperatives require and return expectations conflict with the ecological limits of wild-capture fisheries. We propose that digital platforms, based on cooperative principles, can address these barriers by generating standardised cooperative profiles as a byproduct of daily operations, enabling portfolio aggregation that reduces per-cooperative assessment costs, and supporting continuous impact measurement. A decentralised data architecture based on a distributed ledger system is proposed to ensure fishing cooperatives maintain ownership of their data whilst participating in investment networks. This model demonstrates how technology can serve cooperative enterprises rather than extract value from them.

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Introduction

Small-scale fisheries, importance and challenges

Small-scale fisheries are the backbone of global fisheries systems. They provide at least 40% of global catches (37.3 million tons) whilst supporting 492 million people who depend at least partly on small-scale fishing for their livelihoods.[1] They generate 44% (US$7.2 billion) of the economic value of all fisheries landed, employ 52.8 million people directly in harvesting and processing, with a further 60.2 million along value chains. Nearly half of small-scale fisheries workers are women.[2] In Latin America, 90% of the fleet is classified as small-scale, employing over 1.5 million people and contributing 13.6% of global catch.[3] Mexico exemplifies this pattern with 78,168 small-scale vessels compared to just 1,622 industrial boats.[4]

Many small-scale fishing communities have developed sophisticated governance systems over generations, including territorial use rights, seasonal restrictions and community-based monitoring.[5] These systems often embody the principles identified as essential for successful common pool resource management.[6] However, these governance structures frequently lack formal recognition and face pressure from market forces and regulatory frameworks designed for industrial operations. Most fish stocks targeted by small-scale fisheries are under intense pressure, management is typically data-poor,[7] and enforcement is limited.[8]

The Blue Economy

The Blue Economy represents a transformative approach to sustainable ocean resource utilization that has evolved from a niche concept to a global movement worth trillions of dollars. The Blue Economy concept emerged from the 2012 UN Conference on Sustainable Development (Rio+20) in Rio de Janeiro, where Small Island Developing States introduced the framework as a response to the terrestrial-focused “Green Economy” theme. For ocean-dependent nations, a green economy was fundamentally a blue economy recognizing that sustainable devel-

opment required ocean-centered approaches rather than land-based models. The concept evolved rapidly from an idea to a global movement linked to the UN Sustainable Development Goals (particularly SDG 14 "Life Below Water"), the 2018 UNEP Finance Initiative's Sustainable Blue Economy Finance Principles, and widespread adoption by international organizations and governments throughout the 2020s. The World Bank officially defines the Blue Economy as the "sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems."[9] This evolution reflects a fundamental shift in understanding ocean resources not merely as extractive opportunities but as integrated systems requiring sustainable management approaches. The Blue Economy framework now encompasses traditional maritime sectors like fisheries and shipping alongside emerging areas including marine biotechnology, offshore renewable energy, and ocean-based carbon sequestration.

The Blue Economy operates on three foundational principles that should function in harmony. Economic growth through sustainable development of ocean-based activities including fisheries, aquaculture, maritime transport, coastal tourism, offshore renewable energy, marine biotechnology, and seabed mining. Social inclusion focuses on improved livelihoods, job creation, food security, and equitable access to ocean resources, particularly for coastal communities and Small Island Developing States. Environmental sustainability requires preservation, restoration, and regeneration of marine ecosystems while maintaining ocean health and addressing climate change impacts. UNEP's Sustainable Blue Economy Initiative emphasizes that effective implementation requires integrated approaches across sectors rather than siloed management, recognition of ocean ecosystem services including carbon sequestration and coastal protection, response to the triple planetary crisis of climate change, biodiversity loss, and pollution, and equitable benefit sharing with meaningful community participation.[10]

Current global Blue Economy valuations range from $1.5 trillion to $6 trillion annually, with a UNEP assessment placing its value at $2.5 trillion, equivalent to the world's seventh-largest economy,[11] and it is expected to at least double in size by 2050.[12] Key growth sectors driving this expansion include offshore energy, marine

aquaculture, port improvements and coastal tourism. The economic significance extends beyond direct monetary value to encompass broader sustainability benefits. Sustainable ocean management could generate $15 trillion in net positive economic benefits while supporting climate change mitigation through blue carbon sequestration and providing food security for over 3 billion people dependent on marine protein sources. However, achieving these projections requires an estimated $175 billion in annual investment to meet SDG 14 targets by 2030,[13] and SDG 14 has to date received the least investment of all the SDG targets, and is also among the least targeted by private philanthropy.[14]

Funding the Blue Economy and finding Blue Justice

The rapid expansion of the Blue Economy, while presenting unprecedented opportunities for sustainable ocean-based development,[15] simultaneously creates significant risks of further marginalizing small-scale fishing communities.[16] Blue Justice emerged as a framework addressing these concerns, emphasizing that Blue Economy growth must not replicate historical patterns of exclusion and exploitation that have characterized ocean resource development.[17] As coastal spaces become increasingly valuable for tourism, renewable energy, aquaculture, and conservation, small-scale fishers face mounting pressure from competing uses that often possess greater political and economic power.[18] The framework recognizes that ocean spaces are not empty territories available for development but inhabited spaces where fishing communities have established complex social-ecological relationships over generations that encompass economic activities, cultural practices, traditional ecological knowledge and governance institutions that have often sustained marine resources more effectively than state-led management. This marginalization manifests through multiple mechanisms. Spatial displacement occurs when coastal development, marine protected areas or industrial aquaculture restrict fishing access. Economic displacement occurs when value chains prioritize efficiency and scale over community-based production. Political displacement happens when policy frameworks favor large-scale, formal sector activities over traditional practices, often without meaningful consultation with affected communities.

Fishing cooperatives in Mexico

Mexico has one of the largest national networks of fishing cooperatives globally, with over 3,600 registered as of 2024, supporting 320,000 people in fishing and aquaculture and generating US$3 billion annually.[19] Mexico's cooperative model benefits from institutional advantages such as 5 to 20-year exclusive fishing concessions and access to high-value resources that promote long-term stewardship.[20] Some cooperatives have achieved notable success, including the first small-scale fishery certified by the Marine Stewardship Council globally,[21] and many have developed governance systems that combine traditional ecological knowledge with modern management.[22]

Figure 1: Lobster fishemarn. Souce: Pescadata

However, Mexican cooperatives also illustrate the challenges facing collective organizations in the contemporary economy. Neoliberalization of fisheries policy since the 1990s has weakened cooperative structures through market liberalization, reduced government support and increased competition from private enterprises.[23] Many cooperatives have struggled to adapt to conditions that prioritize

individual efficiency over collective sustainability, leading to internal conflicts and organizational decline.[24] This has created a paradox where the most ecologically sustainable and socially beneficial form of fishing organization faces systemic disadvantages in accessing markets, credit and technical assistance. These cooperatives now operate in a challenging environment where they must balance collective principles with market pressures, often lacking the resources to compete with private operators or access emerging Blue Economy opportunities. This weakening has also occurred alongside governance changes that prioritize export-oriented production, often at the expense of local catches that provide important protein to coastal communities.

Funding Patterns in the Blue Economy

Analysis of investment flows in the Blue Economy reveals disparities that systematically disadvantage small-scale fishing cooperatives and coastal communities. Current funding patterns reflect broader structural inequalities in development finance, where large-scale, technology-intensive projects attract disproportionate investment compared to community-based initiatives with demonstrated social and environmental benefits.[25] Understanding these patterns is crucial for developing strategies to redirect capital toward more equitable and sustainable ocean development models.

Venture capital and private equity investment in ocean technologies has grown substantially, reaching billions of dollars annually, but this investment concentrates heavily on technological solutions targeting wealthy consumer markets rather than addressing the needs of fishing communities in the Global South. Marine biotechnology, satellite monitoring systems, and alternative protein development attract significant investment, while innovations that could directly benefit small-scale fishers, such as appropriate-scale processing equipment, community-owned cold storage, or cooperative management platforms, struggle to access capital. The Ocean Returns report highlights ocean investment changes over time, with 2022 being the year of highest investment ($4.7 billion), of which a significant proportion went to supply chain and port management technology, and just 2.5%

into fisheries.[26] Investments in early stage (pre-seed, seed) companies across the space (small investments with capital sizes more aligned with needs in the Global South) are also in decline, from a peak in 2021.[27]

Table 1 Global VC funding of blue investments. Adapted from Katapult Ocean et al. 2025

Year	Leading investment category	Fisheries categories
2025	Bluetech and ocean observation (autonomous defense vessels, drones) -$746m	Seafood logistics & marketplaces - $30m
2024	Wastewater treatment - $566m	Seafood logistics & marketplaces - $50m Fishing technology - $6m
2023	Water management - $761m	Seafood logistics & marketplaces - $23m Fishing technology - $15m
2022	Shipping and ports- $2.7b	Seafood logistics & marketplaces - $81m Fishing technology - $41m
	Shipping and ports- $7.3b	Seafood logistics & marketplaces - $281m Fishing technology - $101m

The concentration of Blue Economy investments in specific geographic regions further exacerbates these disparities. Developed countries and emerging economies with large aquaculture industries receive the majority of investment flows, while Small Island Developing States and coastal communities in developing countries face severe capital constraints. This geographic bias undermines the stated objectives of many Blue Economy initiatives to address climate vulnerability and promote inclusive development in the most ocean-dependent communities. Impact investing, despite its focus on social and environmental outcomes, has struggled to develop appropriate instruments for supporting fishing cooperatives. Tradi-

tional impact investment metrics often fail to capture the multidimensional benefits that fishing cooperatives provide, including social cohesion, traditional knowledge preservation, and ecosystem stewardship. Additionally, the expectation of measurable financial returns within specific timeframes conflicts with the longer-term, community-controlled development processes that characterize successful cooperative initiatives.

Funding Technology in Fisheries: Market Access Bias

The technology funding landscape in fisheries demonstrates a pronounced bias toward solutions that facilitate seafood market access to wealthy consumers in the United States and European Union, while neglecting innovations that could strengthen local and regional food systems or enhance community-based resource management. This pattern reflects broader dynamics in development finance where solutions are designed primarily to integrate Global South producers into global value chains rather than strengthening local economic systems and governance structures.

Traceability technologies represent one of the most heavily funded categories of fisheries technology, driven primarily by regulatory requirements in importing countries and consumer demands for supply chain transparency. While these technologies can provide benefits to fishing communities, their design and implementation often prioritize the information needs of distant consumers and regulatory agencies over the data needs of fishing communities themselves. The resulting systems frequently extract valuable data from fishing communities while providing limited direct benefits to the data producers. Additionally, traceability is often linked to eco-certifications. While eco-certifications are in demand from consumers in the Global North,[28] price premiums do not always trickle down to the fishers who caught the fish, particularly not in amounts significant enough to cover the costs of additional data generation or eco-certification audits.[29]

With the blockchain “boom” of the early 2020s, blockchain-based supply chain platforms attracted substantial venture capital investment, with many companies

raising millions of dollars to develop systems that can track fish products from boat to plate.[30] However, these platforms typically require significant upfront investment in hardware and training, create dependencies on external technical support, and generate revenue models that benefit technology companies and large buyers rather than fishing communities. The complexity of these systems often excludes smaller-scale operations that lack the technical infrastructure or administrative capacity to participate effectively. If fishers do not see benefits from using technology, they will simple not use it, and projects will not move beyond pilot phases.

Alternative Approaches: Community-Controlled Technology Development

The limitations of market-driven technology development in fisheries leave a niche for the emergence of alternative approaches that prioritize community control, data sovereignty, and collective benefit. Technology for fishers, rather than for fisheries. These approaches recognize that technology is not neutral but embodies specific assumptions about social organization, economic relationships, and power distribution.[31] Community-controlled technology development seeks to create tools that strengthen rather than undermine traditional governance systems and cooperative organization.

Platform cooperativism provides a theoretical framework for developing technology that serves cooperative enterprises rather than extracting value from them.[32] This approach applies cooperative principles to digital platform design, ensuring that platform governance, ownership, and benefit distribution align with democratic decision-making and collective ownership. For fishing cooperatives, platform cooperativism offers pathways to develop and use technology that enhances their existing organizational strengths while providing access to markets and investment on terms they control. Similarly, data sovereignty emerges as a key principle in community-controlled technology development, recognizing that data generated by fishing communities represents valuable intellectual property and traditional knowledge that should remain under community control.[33]

The PescaData platform is an example of community-controlled technology development that implements governance structures that ensure fishing communities retain control over their data while accessing tools that can enhance their operations and market access.[34] The platform's design process involved extensive consultation with fishing cooperatives to ensure that technological features align with cooperative decision-making processes and community priorities.[35] During PescaData´s design phase, fishers decided what data would be shared with their fishing cooperatives, and the cooperatives decided on what data would be made visible to PescaData administrators.[36] Originally developed as a digital catch log, PescaData now operates as a software-as-a-service platform where fishing cooperatives can manage their catches, operational costs, online presence, and where fishers can interact and share best practices with peers. PescaData currently operates in Mexico, with some additional users in Latin America. PescaData has more than 30 active fishing cooperative users who have recorded over 10 million kilos of seafood since 2021. Additionally, over 350 community-based solutions have been shared through PescaData´s peer-to-peer solutions module, contributing to four Sustainable Development Goals and promoting replication among fishers.

Figure 2: Pescadata in use. Source: Pescadata

By combining an existing digital tool that is used by community-level, legally registered organizations, Blue Economy funds could be channeled through fishing cooperatives, opening new pathways for intervention and investment that support key local institutions and promote sustainable fisheries. New financial models, such as outcome-based financing, concessional loans, blue carbon credits or biodiversity credits, could all operate under this model, with tools like PescaData providing mechanisms to measure impact over time. By including the fishing cooperatives in the governance model of PescaData, through distributed ledgers, fishing cooperatives retain ownership of their data and can benefit from any value created.

Research Design

Whilst the Blue Economy offers tremendous potential for coastal communities, the mechanisms for connecting small-scale fishing cooperatives with appropriate investment remain underdeveloped. Traditional financial institutions overlook cooperatives due to perceived risks and the absence of standardized documentation. Impact investors and donors seeking sustainable ocean opportunities struggle to identify and evaluate prospects in small-scale fisheries due to the sector's data-poor nature. Digital platforms offer potential solutions by providing mechanisms for cooperatives to document their practices, governance and impacts in standardized formats that investors can evaluate, and to create portfolios of investments that allow larger investors to meet the needs of many smaller capital allocations. However, platform design requires careful attention to power dynamics, data sovereignty and community ownership to avoid reproducing extractive relationships under new technological forms. This research addresses two principal questions:

1. What role do fishing cooperatives play as institutional structures for receiving and managing blue economy investments?
    a. What capacity do fishing cooperatives need for external investment?
    b. Why do investors not invest in fishing cooperatives?

2. How can digital platforms be optimized to facilitate investment in small-scale fishing cooperatives?
    a. How can PescaData´s technological design and governance system be improved to ensure effective participation of fishing cooperatives in the Blue Economy?
    b. How can data be shared over the network that encourages sustainable fishing as well as meets the principles of data cooperativism?

Methodology

This research employs a mixed-methods design grounded in platform cooperativism, community-based natural resource management and social justice. The research integrates multiple data sources collected to address questions about fishing cooperatives' capacity for blue economy investment and digital platform optimization in Mexican fisheries.

Research questions:

1. What role do fishing cooperatives play as institutional structures for receiving and managing blue economy investments?

A literature review of scientific and grey literature on the use of technology in fisheries and the potential for using distributed ledger technology was conducted to exemplify the possibilities for technological support for blue economy enterprises in small-scale fisheries. The PescaData mobile application and software was used as a baseline existing technology in small-scale fisheries in Latin America.[3738] The Holochain protocol is used as an example of a distributed ledger system that favors community control and data management.[3940] although other protocols are available.

Results

Fishing cooperatives as investment opportunities

Eighty-four active fishing cooperatives were surveyed across eight of Mexico's seventeen coastal states: Yucatán (n=33), Sonora (n=16), Nayarit (n=14), Quintana Roo (n=7), Baja California Sur (n=7), Campeche (n=4), Sinaloa (n=2) and Baja California (n=1). The sample includes cooperatives founded between 1939 and 2025, with a median founding year of 2000, reflecting two distinct waves of cooperative formation, the original cooperatives established under the 1938 Cooperative Law, and the rapid expansion following the 1994 reform that reduced minimum membership from 25 to five. The post-1994 cohort dominates the sample, with 59 cooperatives founded after 1990.

The cooperatives represent 3,758 members, with a mean of 44.7 and median of 14 members per cooperative, though membership varies from five to 388. This discrepancy reflects a highly skewed distribution with a small number of large, historically established cooperatives alongside many smaller organizations. Three-quarters are primarily engaged in wild-capture fishing, with smaller proportions combining capture with aquaculture (9.5%), tourism (9.5%) or aquaculture alone (2.4%). The three dominant legal forms were: Sociedad Cooperativa de Responsabilidad Limitada (SC de RL; 31.0%), SC de RL de Capital Variable (29.8%) and Sociedad Cooperativa de Producción Pesquera (SCPP; 27.4%). Women represent 12.2% of cooperative members for whom gender-disaggregated data were available (428 women of 3,495 gender-identified members). Youth participation (under 30) is similarly limited at approximately 10.5%. These figures are consistent with broader patterns in Mexican small-scale fisheries where women's contributions are often underrecognized, though the survey captures formal membership rather than the broader workforce including women in processing, sales and administration[41].

Diversity of Fishing Operations

Fifty-one distinct species or species groups were reported across the sample. The most frequently targeted were finfish ("escama", 41.7%), followed by octopus (33.3%), lobster (26.2%), grouper (14.3%) and blue crab (13.1%). Cooperatives held an average of 2.9 commercial fishing permits each, with the most diversified holding up to 11. Twenty-five percent (n=21) also held fishing concessions providing exclusive territorial use rights.

Market Orientation and Export Participation

The primary market orientation is local with 51.2% selling to local markets, 14.3% serving national markets and just 7.1% reporting international markets as their primary channel. However, through intermediaries, 39.3% reported that their products ultimately reach international markets. This discrepancy reveals the role of intermediaries in the value chain with many cooperatives selling locally to buyers who subsequently export. Export orientation has geographic patterns. Baja California Sur cooperatives (57.1% with international primary markets) target high-value species such as abalone and lobster for Asian and North American markets, whilst cooperatives in Yucatán and Nayarit, despite producing internationally traded species like octopus and shrimp, primarily sell to local intermediaries. This suggests that market access infrastructure and intermediaries, rather than species alone, determine whether cooperatives capture export-level returns.

Land and Property Rights and Administrative Capacity

Secure land tenure is a foundational requirement for infrastructure development, credit access and long-term operations. Only 28.6% of surveyed cooperatives hold property titles in the cooperative's name. A further 23.8% operate on land titled to individual members, 9.5% use ejidal (communal) land, and 9.5% reported having no title at all. The remainder operate under government concessions, local agreements and other arrangements. Financial formality varied substantially. 84.5%

maintain income and expense records, 79.8% have a positive compliance opinion from Mexico's tax authority (SAT), and 82.1% are registered under a fiscal regime. However, significant gaps persist: 29.8% lack an institutional bank account, only 60.7% maintain a budget, and 33.3% lack formal internal regulations. These deficiencies cluster in smaller, more recently formed cooperatives.

Credit Access and Financial History

Nearly half of surveyed cooperatives (47.6%) reported having never accessed any form of credit. Among those that have, 35.7% obtained loans from buyers or suppliers (often as advance payments for future catch), whilst only 14.3% accessed credit from banking institutions. This reliance on buyer-financed credit locks cooperatives into unfavorable agreements and limits their negotiating power. Despite this limited credit history, cooperatives expressed strong interest in external financing: 71.4% in donations, 67.9% in subsidies, 63.1% in loans and 46.4% in investment. Preferred uses center on operational needs: equipment acquisition (81.0%), maintenance (73.8%), surveillance of fishing zones (52.4%), technological innovation (52.4%), certifications (46.4%) and conservation activities (45.2%).

Investment Potential from the POV of Investors

The central challenge confronting impact investors is transaction volume. Unlike sectors where single investments deploy millions, individual fishing cooperatives typically require $10,000–$250,000, creating operational inefficiencies for institutional investors whose due diligence costs can represent a significant percentage of the proposed investment, particularly in a complex and high-risk sector. Philanthropic funders reported "pilot fatigue", having supported numerous small-scale fisheries initiatives that demonstrated proof-of-concept but lacked pathways to replication or growth. The absence of mechanisms to aggregate cooperatives into investment portfolios means transaction costs remain prohibitively high. Philanthropic funders hope impact investors will fill this void[42] although skepticism remains. The heterogeneity of the sector compounds these challenges. Cooperatives vary dramatically in sophistication, from those with professional manage-

ment and eco-certifications to those existing primarily as legal vehicles for permit access. One investor described needing to build a new assessment model for each cooperative, rendering most investments economically unviable under current fund structures.

Data Governance System Design

PescaData is Latin America's most widely used fisheries technology platform. Developed by COBI in 2018 as a catch log, it was repurposed between 2020 and 2023 as a software-as-a-service system combining a mobile app with web dashboards for cooperative management of landings, expenses, human resources and permits. Individual fishers receive catch logs, weather forecasts, integration with the Hylo social network, and a peer-to-peer solutions network. PescaData currently has 2,500 users, over ten million kilos of seafood landed, and over 350 solutions shared that align with SDGs 5, 8, 13 and 14. In 2023, Servicios Digitales para la Pesca Sostenible SAPI de CV was created to host PescaData's commercial development. The company bylaws allow platform cooperative-style governance where fishing cooperatives can become owners of the platform and active participants in governance.

Holochain offers an agent-centric approach to distributed computing that aligns with cooperative principles. Unlike blockchain systems that maintain a single global ledger requiring consensus across all participants, Holochain operates on a distributed hash table (DHT) model where each agent maintains their own local chain of data entries. This means fishing cooperatives can maintain sovereignty over their data whilst participating in a larger network. The system validates data through peer validation rather than energy-intensive mining. Each cooperative would operate as an autonomous agent with cryptographic control over their data chain, enabling selective sharing with network participants. Unlike blockchain, Holochain scales with network size, making it suitable for deployment across thousands of cooperatives. Holochain's native support for governance applications (hApps) enables democratic decision-making within and between cooperatives. In the context of small-scale fisheries, this architecture addresses several

challenges. Cooperatives maintain control over catch data, sustainability metrics and traditional knowledge, addressing concerns about data extraction by external platforms. Native micropayment capabilities allow direct value transfer from data consumers to producers without intermediary platforms extracting rents, and smart contracts could distribute revenues according to cooperative-defined rules. A proposed distributed ledger data flow architecture was constructed (see Supplementary information S1) to show how a protocol could support lending and impact measurement.

Discussion

This study examined the role of fishing cooperatives as institutional structures for Blue Economy investment and how digital platforms could facilitate cooperative-investor connections. Three principal findings emerged. Firstly, Mexican fishing cooperatives are not homogenous, and many lack the financial formality and standardized documentation investors require. Secondly, the Blue Economy investment landscape is structurally misaligned with fishing cooperative structures, due diligence costs are disproportionate to investment sizes and return expectations conflict with ecological limits. And finally, digital platforms such as PescaData could potentially bridge this gap by generating investor-relevant data as a byproduct of cooperative operations, but only if platform design respects data sovereignty and meets fishers' needs.

Our cooperative capacity assessment revealed a "formality gap" between the actual institutional capacity of cooperatives and the standards external financiers use to evaluate organizational readiness. Most cooperatives surveyed maintain governance structures consistent with Ostrom's design principles.[43] However, a third lacked institutional bank accounts, half had no credit history, and 40% operated without planned budgets. These deficits do not necessarily reflect governance failure but rather the administrative consequences of operating on the margins of Mexico's formal economy, a condition shaped by decades of neoliberal restructuring that weakened cooperative support systems without replacing them.[44][45] Additionally, the absence of secure institutional land tenure reduces investment

readiness and collateral availability for investors, with property registered to individual members creating governance risks. The 1994 reform to Mexico's Cooperative Law exacerbated this condition by reducing minimum membership from 25 to five, enabling the proliferation of small cooperatives that often serve primarily as legal vehicles for permit access rather than institutions for collective action. Cooperatives founded after 1990 tend to have smaller membership and less formal governance. The difference between these organizations and the large, historically established cooperatives with international market access and eco-certifications is significant,[4647] yet the smaller organizations constitute the great majority of fishing cooperatives in Mexico.

Our investor consultations identified barriers consistent with broader analyses of sustainable fisheries financing.[4849] The high cost of due diligence relative to capital allocation is to be expected when capital needs are low, but our analysis reveals the heterogeneity of small-scale fishing organizations that vary across legal form, species, market orientation, financial formality and governance sophistication, making it impossible to develop a single assessment template. And our research was only on one of Latin America´s many countries. The aforementioned variables will change in each country, meaning conventional due diligence models are structurally inadequate for fishing cooperatives or other fisher associations.

Tension also exists between investor return expectations and ecological sustainability. Wild-capture cooperatives face ecological constraints and seasonal uncertainty that require investment models that generate economic returns through value addition or efficiency, not increased production. Traditional fisheries investment models generate returns by increasing catch volume, which directly contradicts the sustainable management needed for long-term ocean health and livelihoods. This is particularly acute given that many Mexican fisheries already operate at or beyond maximum sustainable yield.[50] Unlike agriculture or aquaculture, wild-capture cooperatives face hard ecological limits. Without clear models for value addition or efficiency gains that do not depend on increased extraction, investors struggle to construct investment theses satisfying both impact and return requirements.

The discrepancy between cooperatives' primary sales channels (51.2% local, 7.1% international) and final product destination (39.3% reaching international markets) reveals intermediary capture of value, a dynamic well-documented in small-scale fisheries.[51] Strategic investments in supply-chain companies working with small-scale fishers have occurred but remain limited, with many organizations continuing to depend on grants, effectively subsidizing the supply chain. These companies cannot scale due to dual capital constraints, both their own and the countless improvements needed by their suppliers, the cooperatives.[52]

Under this model, fishing cooperatives are structurally uninvestable. But the model itself may be flawed.[5354] If impact is understood at the ecosystem level rather than the economic level (or ideally, both) a portfolio of thousands of cooperatives receiving modest capital to improve equipment, adopt sustainable practices and strengthen governance could generate social and environmental impact at a scale much larger than individual high-growth enterprises. Yet most current blue finance models follow the venture capital model, searching for "narwhals" (unicorns of the ocean),[55] or are fundamentally misaligned with the realities of small-scale fisheries. For example, in 2025 Mexico launched a Blue Bond with the objective of facilitating credit to the fishery sector.[56] Yet the requirements for receiving funds required the fishery to be MSC certified (there is only one small-scale fishery currently MSC certified, and certification costs are beyond the means of most cooperatives), and the funding recipient cannot operate inside marine protected areas (which are zoned for multiple uses in Mexico, and home to many of the most sustainable small-scale fisheries),[5758] effectively excluding the entire small-scale fishery sector, including the aforementioned MSC certified fishery. Similarly, the Ocean Impact Navigator, which presents a framework for measuring ocean innovation for investors´ impact, does not include any socio-economic KPIs beyond "jobs created" for ocean start-ups, nor are any ocean start-ups that could directly benefit small-scale fishers considered in their sector scoping.[59] What is considered is "smart fishing-gear monitoring technologies, waste reduction solutions, supply chain tracking, low-emission fishing vessels, fisheries management and stock assessments,"[60] which is technology for fisheries and not fishers.

The distinction between technology designed for fishers and technology designed for fisheries is important. The former creates value for users that incentivizes sustained adoption. The latter extracts data for external consumption (e.g. a start-up, supply chain or end consumer). In highly enforced fisheries, technology can be a requirement. In the low governance environments in which many of the world´s small-scale fisheries lie, technology will only be used if it provides additionality to the fishers. In this sense, technology must be designed for the first level of the supply chain (the fishers/their organizations) and propagate upwards. Our analysis of PescaData's architecture and the proposed Holochain extension suggests mechanisms through which digital platforms could facilitate cooperative-investor connections. Platforms can generate standardized cooperative profiles as a byproduct of operational use. PescaData already captures species composition, catch volumes and value, membership and sustainability practices. The proposed distributed architecture would extend this to governance structures, financial histories and data quality metrics. Portfolio aggregation through standardized metadata would reduce due diligence costs. If the marginal cost of evaluating additional cooperatives falls because profiles are generated continuously through platform use rather than bespoke external assessment, the economics of investment change. The portfolio model is established in development finance but has not been applied to fishing cooperatives, primarily because the data infrastructure for standardized assessment has not existed. PescaData's network and the proposed Holochain DHT provide a technical pathway for this aggregation. Platform-generated data also enables continuous impact measurement because when investment flows through a platform that simultaneously tracks catch data, income and financial performance, the basis for impact claims becomes substantially more robust than post-hoc evaluation. Investors and cooperatives can implement a Before-After-Control-Impact framework on the credit where changes on economic (e.g. volume landed, value), and social (e.g. fisher income, access to social security, etc.) metrics can be tracked over time. However, such data flows involve information cooperatives consider confidential, requiring data sharing agreements that clearly define ownership. Whether the Holochain architecture's permission matrices adequately reconcile these competing demands in practice remains an empirical question requiring implementation research.

Several limitations should inform interpretation of our findings. Our sample of 84 cooperatives represents less than 2.5% of Mexico's registered fishing cooperatives and was not randomly selected. Recruitment through COBI's networks likely introduces bias toward more organized cooperatives, meaning the investment readiness challenges documented here should be understood as favorable estimates. Investor perspectives draw on participation in Blue Economy forums and literature reviews rather than a systematic survey of investment decision-makers, although this was itself informed by very low investor participation in surveys. The Holochain architecture remains a conceptual proposal with practical challenges of deploying distributed ledger technology in connectivity-constrained coastal environments with limited digital literacy are substantial.[61] Finally, the focus on Mexico limits direct applicability to other Latin American contexts where cooperative traditions, legal frameworks and fisheries governance differ. Several priorities emerge. Impact investors must be willing to share their means and processes for investing in small-scale fisheries, a competitive yet private space will only further drive inequalities. A standardized due diligence framework for fishing cooperatives should be accompanied by public documentation of successful investment models for replication. Longitudinal research tracking cooperative investment readiness and the impact of investments on socioeconomic and ecological indicators will be critical to ensure benefits are felt in both coastal communities and surrounding oceans.

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Supplementary information

S1 - Holochain design

Key elements of a distributed ledger data system that links small-scale fishers with other stakeholders through an agent-based model are described below. Table 2 provides examples of agent types and data. Figure 1 provides a simplified data publishing workflow in which Table 2 data is published and pushed to the marketplace. If buyers (or credit lenders) are interested, then smart contracts execute and the DHT protects sensitive data. Up on smart contracts approval payments are distributed as in Figure 2. Figure 3 connects the data flow architecture to due diligence processes and portfolio creations for potential investors.

Table 2 - Distributed Hash Table (DHT) Structure

Agent Types	Data Hashes
Cooperative Nodes: Fishing cooperatives as sovereign data producers.	Fishing Records: Individual catch data (species, weight, value), expenses (fuel, ice, oil, etc), GPS coordinates, social indicators (e.g. social security registration, insurance, fisher income).
Aggregator Nodes: Data synthesis and curation services.	Cooperative Profiles: Governance structure, sustainability metrics, compliance records, aggregated catch data, credit and loan information.
Consumer Nodes: Researchers, universities, government, private sector, investors.	Solution Entries: Community-generated sustainability solutions and innovations.
Validator Nodes: Community-elected nodes ensuring data integrity.	Payment Chains: Micropayment transaction histories.

Bridge Nodes: Legacy system integration (PescaData API compatibility).	Reputation Scores: Collaborative ratings for data quality and cooperative performance.

S2 - Cooperative interview format

Evaluación del potencial para implementar proyectos sostenibles en cooperativas pesqueras.

Fecha: _____

Entrevistador/a: _____

Buenos días, mi nombre es_____,
formo parte de Comunidad y Biodiversidad, A.C. (COBI).

Estamos haciendo un estudio para identificar los principales retos y oportunidades de financiamiento en el sector pesquero, con especial interés en conocer iniciativas que ya estén en marcha o posibles soluciones que podrían impulsarse desde cooperativas pesqueras u otras formas organizativas.

Actualmente, en México y América Latina, se están promoviendo diversas iniciativas para fortalecer la Economía Azul y canalizar recursos hacia emprendimientos y actividades sostenibles. Las cooperativas pesqueras tienen un enorme potencial para formar parte de esta ola. Sin embargo, los financiadores no tienen suficiente información sobre el contexto de los posibles proyectos.

El objetivo de esta encuesta es conocer mejor su experiencia y visión sobre las inversiones necesarias en sus actividades – como energía, equipos, mantenimiento, transporte, procesamiento y otras áreas – para explorar cómo podrían

beneficiarse de distintos tipos de fuentes de financiamiento, desde donaciones hasta proyectos con potencial de recibir créditos. Es importante señalar que esta encuesta no garantiza ningún tipo de apoyo ni financiamiento. Nuestro objetivo es poder comunicar a posibles financiadores las oportunidades y necesidades del sector pesquero en pequeña escala para promover la pesca sostenible y el bienestar de las comunidades costeras.

Su participación es voluntaria, pueden detener la entrevista en cualquier momento y decidir qué preguntas desea responder. Toda la información será tratada con estricta confidencialidad y se presentará de forma agrupada y anónima.

La entrevista tomará aproximadamente una hora. Al finalizar el levantamiento de entrevistas y realizar el análisis, compartiremos con usted un resumen de los hallazgos para que pueda conocer los principales resultados.

Sección 1: Notas para la persona a cargo de la entrevista.

Esta sección debe ser llenada previo a la entrevista, por la persona a cargo de la visita, la información puede obtenerla desde Airtable. Es información general sobre la unidad económica que se encontró en distintas fuentes de datos públicos y abiertos.

Localidad: _____ Municipio: _____ Estado: _____

Nombre de la unidad económica: _____ _____

Fecha de inicio de la unidad económica: _____ _____

Registro Nacional de Pesca y Acuacultura (RNPA): _____
_____

Sección 2: Información general de la unidad económica.

A continuación, le haré una serie de preguntas relacionadas con la información general sobre la cooperativa pesquera, como su ubicación, infraestructura, medio de comunicación, el giro de la unidad económica, así como información general sobre el número de empleados, socios y sus prestaciones.

Me puede proporcionar dirección de la cooperativa: _____
_____
_____

En caso de aplicar, me podría indicar los siguientes medios de contacto de su cooperativa:

a) Correo: _____
   _____

b) teléfono(s): _____
   _____

c) Página web: _____
   _____

d) Redes sociales: _____
   _____

Información sobre el representante legal

¿Me puede proporcionar el nombre y teléfono del presidente de su cooperativa?

Nombre: _____
_____

Teléfono(s): _____
_____

Información sobre el tipo de actividades

¿Qué tipo de actividades realiza tu cooperativa en relación con la pesca?

a) Captura b) Acuacultura c) Ambas d) Otras: _____

¿Cuál es la figura jurídica de su cooperativa?

a) Sociedad Cooperativa de Producción Pesquera

b) Sociedad de Producción Rural

c) Sociedad de Solidaridad Social

d) Sociedad Anónima de Capital Variable

e) Sociedad Cooperativa de Responsabilidad Limitada

f) Sociedad Cooperativa de Responsabilidad Limitada de Capital Variable

g) Sociedad Cooperativa de Ahorro y Préstamo

h) Asociación Civil

i) Otra: _____

Información sobre socias. socios y empleados

¿Cuántos socios y socias hay en su cooperativa?

Total: _____ socios: _____ socias: _____

En su cooperativa, ¿hay socios menores de 30 años?

Si, hombres: _____ Si, mujeres: _____ No: _____

¿Cuánto personal ocupado hay en su cooperativa?

a) De 0 a 5 personas b) De 6 a 10 personas c) De 11 a 30 personas d) De 31 a 50 personas e) De 51 a 100 personas f) De 101 a 250 personas g) De 251 o más

¿Las y los socios de su cooperativa tiene acceso a las prestaciones?

En la siguiente tabla marcar con X una o más opciones

	Marca con X		Marca con X
Afiliación al IMSS		Fondo de retiro	
Fondo de emergencia		Fondo de ahorro para socios/as	
Becas para hijos/as		Prestamos a socio/as	
Fondo de defunción		Fortalecimiento continuo para socios/as	
Infonavit		Otro	

Información general sobre la unidad económica

¿Su cooperativa forma parte o esta agremiada en alguna federación?

a) Si, especifique cuál: _____
b) No

¿Cuenta con títulos de propiedad del terreno en donde está establecida su cooperativa?

a) Cuenta con título a nombre de la unidad económica

b) Cuenta con título a nombre de particular

c) Terreno ejidal

d) Otra: _____
_____

e) No tenemos títulos de propiedad

La cooperativa cuenta con la siguiente infraestructura:

En la siguiente tabla marca las opciones con una x

	Marca con X		Marca con X
Cuarto frío		Maquina de hielo	
Planta de procesamiento		Paneles solares	
Área de limpieza y procesamiento de pescado		Muelle o embarcadero	
Sala de reuniones para socios		Granja de producción	
Bodega de almacenamiento de equipos		Oficina administrativa	
Taller de reparación de embarcaciones		Taller de reparación de redes y aparejos	
Estación de combustible		Sistema de radio comunicación	
Sistema de tratamiento de aguas residuales		Área de secado (para pescado seco o salado)	
Tanques para animales vivos		Otros:	
		No cuento con un espacio exclusivo de la unidad económica	

¿Me puede indicar con que servicios cuenta la cooperativa?

De la siguiente tabla marca las opciones con una x

	Marca con X		Marca con X
Internet		Teléfono	
Agua potable		Computadora	
Drenaje de las aguas residuales		Otro	

Conexión a CFE		Otro	
Servicio de recolección de basura		Otro	

Nota (lo llena la persona que entrevista sobre los detalles de la infraestructura):

La cooperativa, ¿Cuenta con reglamentos o mecanismo de sanciones?

Puede seleccionar una o más opciones

a) Reglamento interno b) Mecanismos de sanciones c) Otros:_____ d) No

Sección 3: Esfuerzo pesquero y otras autorizaciones

En esta sección le estaremos haciendo algunas preguntas relacionadas con las principales especies que captura, permisos y embarcaciones de la unidad económica, esta información la estamos compilando para entender un poco más sobre el contexto de su cooperativa.

Me podría indicar, ¿Cuáles son las tres especies más importantes (especies objetivo) para su cooperativa?

Especie 1: _____

Especie 2:_____

Especie 3: _____

Me podría indicar ¿Cuántas embarcaciones activas tiene su cooperativa? _____
_____
_____

Me podría indicar, ¿Para qué especies o grupos de especies tienen permiso de pesca comercial activos en su cooperativa? _____
_____
_____
_____

Me podría indicar, ¿Para qué especies o grupos de especies tienen concesión de pesca activas en su cooperativa ? _____
_____
_____

¿Lleva algún registro de sus capturas pesqueras?

a) En bitácora de papel b) Sistema tecnológico propio
c) App, especifique:_____

d) Otro:_____ e) No

¿Cuál es el principal tipo de mercado al cual vende directamente el producto de su cooperativa?

Puede seleccionar más de una opción

a) Local b) Nacional c) Internacional

¿Sabe cuál es el mercado final del producto de su cooperativa?

Puede seleccionar más de una opción

a) Local b) Nacional c) Internacional d) No sé

Su cooperativa, ¿Cuenta con algún permiso de sanidad?

a) SENASICA b) Otro(s): _____

Sección 4: Manejo pesquero, conservación y colaboraciones

A continuación, le haré unas preguntas relacionadas sobre si la cooperativa participa o no en la implementación de iniciativas o proyectos relacionados con manejo pesquero, conservación de recursos pesqueros en su comunidad.

Su cooperativa, ¿Participa o ha participado en un Proyecto de Mejora Pesquera (FIP por sus siglas en inglés)?

a) Si, especifique: _____ periodo de tiempo: _____

b) No ha participado d) No se qué es eso

¿Cuenta con alguna eco-certificación vigente?

a)MSC b)ASC c) FairTrade d) Otra: _____ e) No d) No se

Su cooperativa, ¿Cuenta con una reserva marina vigente?

a) Reserva comunitaria b) Zona de Refugio Pesquero c) No tenemos d) Antes teníamos, especifique:_____ e) No se qué eso

¿Las zonas de pesca de su cooperativa están dentro de un Área Natural Protegida?

a) Si, especifique: _____
___ b) No c) No sé

¿Su cooperativa participa en actividades ambientales, de educación ambiental u otras?

a) Si, especifique: _____ b) No

¿Cuenta con soluciones documentadas en alguna plataforma?

a) Si, PescaData b) Si, Panorama c) Otro:_____ d) No

¿Colabora con alguna institución académica, organización de la sociedad o agencia de gobierno? a) OSC especifica:

b) Academia:

c) Gobierno:

d) Otras cooperativas:

e) Otros:

f) No

¿Su cooperativa tiene la posibilidad e interés de instalar energías limpias, por ejemplo paneles solares? _____ ¿Por que? _____

Sección 5: Sobre asuntos administrativos, fiscales y bancables

En esta sección, le pediremos información general sobre la operación de su cooperativa en temas administrativos, procesos generales e interés en financiamientos y su implementación.

La cooperativa lleva acabo las siguientes actividades administrativas:
Puede seleccionar más de una opción

	Marca con X		Marca con X
Llevar un presupuesto (mensual y anual)		Cuenta con cuenta bancaria a nombre de la coopertativa	
Tiene un comité o responsable administrativo/financiero		Estrategias de transparencia del uso del recurso	
Lleva un registro de ingreso-gasto (digital/software/ manual)		Otro	

Me pudiera compartir ¿Bajo que régimen fiscal está registrada su cooperativa?
a) General de Ley Personas Morales
b) Personas Morales con Fines no Lucrativos
c) Consolidación
d) Sociedades Cooperativas de Producción que optan por diferir sus ingresos
e) Actividades Agrícolas, Ganaderas, Silvícolas y Pesqueras
f) Opcional para Grupos de Sociedades
g) Coordinados
h) Hidrocarburos
i) Régimen de Enajenación o Adquisición de Bienes
j) No sé
k) No estamos dados de alta

Si, su cooperativa cuenta con su Registro Federal de Contribuyente, ¿me lo pudiera compartir? _____
_____

¿Su cooperativa cuenta con opinión de cumplimiento positiva del SAT?
a) Si b) No c) No sé

¿ En nombre de la cooperativa ha recibido/tenido acceso a créditos?___ si la respuesta es Si ¿Podría indicarme el tipo de crédito?
a) Préstamos de la banca tradicional b) Préstamos de compradores
c) Préstamos de proveedores e) Préstamos de grupos de ahorro y préstamos comunitarios f) Prestamos de federaciones
g) Otro:

Las socias y socios de la cooperativa, ¿Tienen interés en recibir financiamiento externo?
Seleccione una o más opciones
a) Subsidios b) Inversiones c) Préstamos d) Donaciones e) No

Si “no”, ¿por que? _____
_____

¿Para que utilizarían este financiamiento?
En la siguiente tabla marca las opciones con una x

	Marca con X		Marca con X
Innovación tecnológica		Vigilancia	
Mantenimiento de equipo		Acuacultura	
Certificaciones		Maricultura	
Adquisición de equipos		Otro	
Actividades de conservación/ restauración		Otro	

Sección 6: Ingresos y egresos
En esta sección, le pediremos información general relacionada a los ingresos y los principales egresos de la cooperativa a para su operación. Asi como información general sobre los consumos de energía eléctrica.

Ingresos

¿Cuáles son los principales medios de obtención de ingresos/fondos de la cooperativa?

Puede seleccionar más de una opción.

a) Venta de pescados y mariscos capturados b) Venta de pescado y marisco comprado

c) Subsidios d) Donaciones

e) Turismo f) Restaurante

g) Renta de terreno h) Otro:_____

_____

¿Cuánto es el ingreso anual (en pesos mexicanos) de la cooperativa por actividades relacionadas a la pesca?

Seleccionar una opción.

a) menos de 25,000 b) de 25,000 a 50,000 c) de 50,000 a 100,000

d) de 100,000 a 250,000 e) de 250, 000 a 500,000 f) de 500,000 a 1,000,000

g) 1,000,000 a 2,500,000 h) mayor a 2,5000,000 i) no sé

En su cooperativa, realizan un proceso post-captura para agregar valor a sus capturas

En la siguiente tabla marca las opciones con una x

	Marca con X		Marca con X
Fileteado		Otro	
Cocido		Otro	
Enlatado		Otro	
Empacado al vacío		Otro	
Transformación del producto (ej. harinas, aceite, piel)		Otro	

Además de los ingresos recibidos por la cooperativa, identifica algunas otras fuentes de ingresos de sus socios.
En la siguiente tabla marca las opciones con una x

	Marca con X		Marca con X
Venta de pescado y mariscos capturados		Construcción	
Venta de pescado y mariscos comprado		Otro	
Subsidios		Otro	
Turismo		Otro	
Elaboración y venta de artesanias		Otro	

Egresos

¿ Me podría indicar bajo que esquema tarifario llega la luz a su cooperativa? Seleccionar una opción.

a) 1 b) 1A c)1B d) 1C
e) 1D f) 1E g) 1F h) DAC (Doméstica de Alto Consumo)
i) PDBT (Pequeña Demanda en Baja Tensión) j) GDBT (Gran Demanda en Baja Tensión) k) RAB (Rescate Agrícola Baja Tensión)
l) APBT (Agrícola de Pequeña Demanda en Baja Tensión) m) APMT(Agrícola de Pequeña Demanda en Media Tensión) n)GDMTH (Gran Demanda en Media Tensión – Horaria) ñ) GDMTO (Gran Demanda en Media Tensión – Ordinaria)
o) RAMT (Rescate Agrícola en Media Tensión) p) DIST q) DIT r) No

¿Me podría indicar el Registro Móvil de Usuario (RMU) de CFE con el cual está dado de alta su cooperativa?
Nota para entrevistador: Pedimos su RPU para saber si la CFE tiene capacidad de instalar energía distribuida. A veces las centrales eléctricas no tiene más capacidad así que aun si quieren poner paneles solares, no sería posible.

¿En su localidad existe actualmente algún tipo de subsidio o apoyo económico

para el consumo de energía eléctrica? En caso afirmativo, ¿durante qué periodo del año se aplica y qué porcentaje de descuento representa aproximadamente?

Si conoce el consumo de luz en Kwh, ¿me podría indicar de cuánto es el consumo (promedio) de manera mensual de su cooperativa?

En promedio la cooperativa ¿cuánto gasta anualmente en luz?

Consumo de hielo

¿Utiliza hielo para realizar operaciones relacionadas con la pesca?
a) Si b) No

¿Para qué actividades o fases de la red de valor pesquera utiliza el hielo?
_____

¿Cómo consigue el hielo que utiliza para la actividad pesquera?
Seleccionar la opción, si menciona mas de una, indique la principal manera
a) Tenemos planta de hielo b) La comunidad tiene plan-
ta de hielo c) Viajamos a otra comunidad
d)Otro:

Considerando un promedio anual, ¿cuántos kilos de hielo utilizan semanal-mente?

Considerando un promedio anual, ¿cuál es el precio por kilo del hielo?

En el periodo en que utilizan más hielo, ¿Cuánto consumen a la semana?

Podría mencionarme las tres pesquerías en las que utiliza más hielo y el porcen-taje de hielo que utiliza en cada una de ellas

Pesqueria 1:	% de hielo:
Pesqueria 2:	% de hielo:
Pesqueria 3:	% de hielo:

En promedio ¿Cuánto gasta mensualmente de combustible para conseguir hielo?

En promedio ¿Cuánto gasta mensualmente de combustible en embarcaciones y operaciones?

Esto es todo por nuestra parte, ¿tiene alguna duda o comentario general?
_____
_____
_____

Muchas gracias por su tiempo y por compartir con nosotros esta información. Próximamente estaremos en contacto para contarle sobre los principales hallazgos.

Glosario para entrevistadores

Economía azul: Uso sostenible de los recursos marinos y costeros para el desarrollo económico, la mejora del bienestar humano y la preservación de la salud de los ecosistemas oceánicos.

Esquema tarifario CFE: Son las tarifas de CFE, es decir, son los precios que cobra la Cmosión Federal de Electricidad por el suministro de energía eléctrica en México. Varian por zona e industria.

Unidad económica: Unidad de producción y/o distribución de bienes y/o servicios, ubicada en un lugar físico específico y con una estructura de personal. Es decir, es un negocio o establecimiento que realiza actividades económicas, en este caso relacionado con la pesca.

Proyecto bancable: un proyecto que pretende generar un retorno sobre la inversión. Por ejemplo, la instalación de una máquina de hielo solar que permite generar ingresos por venta de hielo al público. Tradicionalmente son proyectos financiados por creditos o inversiones.

Personal ocupado: Se refiere a todas las personas que trabajan en su establecimiento, independiente de su si son empleados temporales, de tiempo completo o parcial, y que perciben una remuneración por su trabajo.

Opinión positiva del SAT: Una opinión de cumplimiento positivo del SAT es un documento oficial que emite el Servicio de Administración Tributaria (SAT) para certificar que un contribuyente está al corriente con sus obligaciones fiscales.

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